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PERFORMANCE ANALYSIS AND PORTFOLIO OPTIMIZATION METHOD ON STOCK MARKET INVESTMENT: A STUDY OF PT TELEKOMUNIKASI INDONESIA PENSION FUND YEAR 2006-2011

Ekadiah Finandiarsi and Sudarso Kaderi Wiryono
School of Business and Management
Institut Teknologi Bandung, Indonesia
ekadiahf@gmail.com

Abstract — *PT Telekomunikasi Indonesia Tbk., Pension Fund (DAPENTEL) during year 2006 to 2011 was cannot meet the targets of Return on Investment (ROI) which was set in each early year by its management. This is because most of its funds invested on the stock market investment where the target of investment return is not achieved. The DAPENTEL method of stock investing by external investment manager will give additional investment cost and were not give optimal investment return for the company since most of the year 2006 - 2011 resulting in negative value of ROI. Motivated by these problems I show that stock investment performance analysis by using valuation of the Holding Period Return (HPR), stock risk analysis, and risk premium analysis and selected stocks which are have higher performance than the market as a next year stock investment portfolio. Last, considering their performance value and their risk value as a weighting method will give a better investment result for DAPENTEL Return on Investment (ROI).*

Keywords: pensions fund, investments, stocks, ROI, HPR, Risk, Risk Premium, and Stock weighting

1. Introduction

"Yayasan Dana Pensiun PT Telekomunikasi Indonesia Tbk", hereinafter referred to as DAPENTEL, established in 1982 based on SK KEPMENHUB NO.KM.481/ M.481/KP705/PMB-82 through PT Telekomunikasi Indonesia Tbk., which was known as PERUMTEL has duty to arrange pensions payment to the employees and their beneficiaries. DAPENTEL is a type of pension fund which give a Defined Benefit pension scheme (DB) for the recipient. In the (DB) pension schemes, PT Telkom entered into an agreement to pension beneficiaries, who are the employees during the current work, and the amount of benefits to be received later and governed in accordance with the Regulations of the Pension Fund made by PT Telkom.

A. Company Profile

As a pension fund, DAPENTEL has duties as follows:

- ✓Collecting and receiving funds that will be an asset of DAPENTEL
- ✓Doing management assets owned by DAPENTEL safely in accordance with the Guidelines for Pension Fund Investment Telkom Number: KP.11/HK-20/DPT-012/2010
- ✓Conducting management and implement timely payment of pensions to retired beneficiaries

Vision and Mission

DAPENTEL has a vision "To be the Best Employer Pension Fund in Indonesia". While DAPENTEL missions are:

1. Maintaining continuity of pension benefit payments on time, with the right amount and the right destination
2. Developing assets optimally and safely, and improve service by optimizing competent human resources with best practice
3. Provide the best results and useful for stakeholders

D. Business Issue

The following are business issues being faced by DAPENTEL:

1. The Underperformed of DAPENTEL Return on Investment (ROI) in year 2011. In year 2011 the company got ROI at 12,6% or IDR 1,6trillion, while the targeted ROI is 13,46% or IDR 1,67trillion. The underperformed of company ROI because the company puts a lot of its investment in the asset class of stock to pursue investment returns, that is equal to 22% of the total investment in the company. At the end of the year 2011, the stock market investment targeted return was not achieved.
2. The additional cost of investment by using external Investment Manager (IM). The investment through an external IM will add 2% to the cost of investment for investment fees and investment expenses.
3. The self-managed Investment income of DAPENTEL stock investment is higher than external IM during 2006, 2007, 2009, 2010, and 2011.

Based on the description above it is necessary to evaluate the performance of DAPENTEL stock market investments to create a new portfolio planning for stock market so that the targetted ROI can be achieved.

2. Business Issue Exploration

A. EXTERNAL ANALYSIS

The analysis is done by considering external factors that can affect the performance of stock market in Indonesia.

First, the Jakarta Composite Index is a stock market index that is used by the Indonesia Stock Exchange as an indicator of stock price movements. The index covers entire price movement of stocks listed on the Stock Exchange.

Performance analysis is done by looking at the JCI Holding Period Return (HPR). The analysis will represent Indonesia stock market performance during the first year, with the following formulation:

$$JCI\ HPR = \frac{JCI \text{ value at end } year - JCI \text{ value at beginning of } year}{\text{value of JCI at the beginning of the year}}$$

Then, the JCI analysis was also done to see the value of Indonesian stock market risk ( ), in each individual risky stock. The risk of Indonesia stock market is obtained by determines the value of standard deviation of the stock index over time. The formulation is as follows:

$$r_M = \sigma_{Mi} = \sqrt{\frac{\sum \left[\frac{x_n - \bar{x}}{x_{n-1}}\right]^2}{(p-1)}}$$

x = the value of closing stock index
= average value of closing stock index during the year n-1
p = total data

Table 1. JCI Performance year 2006-2011

JCI	2006	2007	2008	2009	2010	2011
HPR	0.3510	0.3312	(1.0153)	0.4329	0.3046	0.0253
Stndrd Dev	0.0131	0.0148	0.0246	0.0155	0.0127	0.0147

Second, BI Rate (Bank of Indonesia Rate) is the interest rate that reflects the attitude or policy of monetary policy set by Bank of Indonesia and announced to the public. In the operational level, the BI Rate is reflected in the interest rate of short-term money market as the operational target of Bank

of Indonesia monetary policy. Bank of Indonesia interest rate is used as a comparison to the amount of investment risk free rate in Indonesia. Here is the average interest rate of Bank Indonesia during 2006 - 2011:

Table 2. List of Average Rate of Bank of Indonesia

2006	2007	2008	2009	2010	2011
11.83%	8.60%	8.67%	7.15%	6.50%	6.58%

C. INTERNAL ANALYSIS

During 2006 to 2011, DAPENTEL has 95 different stocks. Stock analysis is done through technical analysis, which uses data (prices change) in the past in the form of tables, graphs and so to predict future developments. In this case the rate of return, standard deviation, and risk premium.

1. HPR (Holding Period Return)

As a pension fund, DAPENTEL stock market investing with a long-term orientation. This is done to minimize the risk of investment and to get the company's dividend. Dividend is a healthy indicator of whether a company's financial condition has a healthy balance sheet and a sign that the company will continue to grow. Whereas DAPENTEL, the investment return come from dividends contribute significantly to return of total investment as well as investment protection when stocks are in declining condition.

The HPR Analysis on the DAPENTEL stock investment is performed in 1 year period of time, which DAPENTEL buy the stock at the beginning of the year and sold it at the end of the year. This assumption is used because by investing in period of 1 year, the profit / loss of investment will come from the differences in the stock price at the beginning and end of the year plus dividends earned from each stock.

The calculation formula is as follows:

$$HPR = \frac{(Ending\ -Beginning\ price) + Cash\ Dividend\ per\ share}{Beginning\ Price}$$

However, the calculations used for comparison with the HPR of JCI for this research as follows:

$$HPR = \frac{(Ending\ price\ -Beginning\ price)}{Beginning\ Price}$$

2. Risk (Standard Deviation)

The standard deviation of the rate of return (σ) is a measurement of a risk. It can also be defined as a root of variance. It is formulated as follows:

$$r_M = \sigma_{Mi} = \sqrt{\frac{\sum\left[\frac{x_n - \bar{x}}{x_{n-1}}\right]^2}{(p-1)}}$$

Where:

x = the value of closing stock

= the average closing value of the stock during the measurement year

p = total data

Standard deviation analysis performed on all types of shares held by DAPENTEL during 2006 through 2011. Any shares held by DAPENTEL calculated the standard deviation of its adjusted close price for 1 year. After then, compare it with a standard deviation of JCI in the same year.

3. **Risk Premium**

Risk Premium is a value that reflects on how much differences between the HPR of a stock at the rate of investment in risk-free assets such as government bonds, Certificates of Bank Indonesia, or bank deposits. Risk premium on each share will be reflected in the market portfolio risk premium ( ), in this case is a composite index, the beta coefficients of individual assets to the market portfolio, as shown in the equation of "Security Market Line" as follows:

$$E(r_i) - r_f = \beta_i [E(r_M) - r_f]$$

Therefore, the formula used to calculate the risk premium DAPENTEL shares each year are as follows:

$$Risk\ Premium = HPR\ Stock_i - BI\ Rate$$

Analysis of the Investment Manager

During year 2006 to 2011, the DAPENTEL stock exchanges portfolio is managed through Self Manage investment and by external investment managers (IM). As for table 3 below, in year 2006 to 2009, the external IM consists of FORTIS Investment, Schroeder Investment and BAHANA Securities. While in year 2010 and 2011, the DAPENTEL external IM consists of BNP Paribas, Schroeder Investment and BAHANA Securities.

Table 3 List of DAPENTEL Investment Managers from year 2006 to 2011

Year	Investment Manager
2006 - 2009	1. Self Manage 2. External IM (Fortis Investment, Schroeder Investment, and Bahana Securitas)
2010 - 2011	1. Self Manage 2. External IM (BNP Paribas, Schroder Investment, and Bahana Securitas)

The investment performance analysis is also done by comparing the Return on Investment (ROI) on each IM yearly. Then, based on DAPENTEL Work Plan and Budget which held in every early year, the board of DAPENTEL set the targeted ROI which is consisting of ROI without *SPI (revaluation of investment)* and ROI with SPI. ROI without SPI is the total investment return consisting of shares of stock sales, dividends and other income divided by the amount of investment funds spent to buy the stock. While ROI with SPI is the difference between total stock investments value at year-end closing book and the value of total investment for buying the stock. The result then divided by the value of the stock acquisition.

$$ROI\ of\ stock_i = \frac{Fair\ Value\ of\ Stock_i\ year_n - \ Acquisition\ value\ of\ Stock_i}{Acquisition\ value\ of\ Shares_i}$$

3. Business Solution

The problems had identified which are *first,* the existence of external economic factors that affected the performance of investment, such as the global financial crisis, the decline in Indonesia's macro economic growth, and unsupportive national and regional political. DAPENTEL can overcome these external factors by: make investment decisions quickly and appropriately to save DAPENTEL's asset value and avoid the greater loss of stock value.

Second, as the cause of the problems is lack of skill and experienced of DAPENTEL human resources. Currently, DAPENTEL Head of Investment staffed by 12 people with its own duty-to manage DAPENTEL assets which is worth of billions rupiahs and only a few of them were have experience in

this business before. In addition, the regular training by the company was still not perceived as an enough preparation to meet the requirement of the job. Therefore, to solve this problem DAPENTEL should hire new employees which are already have experience in this field before. DAPENTEL also should provide additional training to improving the employee skill and knowledge.

Third, the underperformed of DAPENTEL stock investment in year 2006 – 2011 made the targeted ROI not achieved, because most of DAPENTEL investment fund are placed in the stock investment portfolio. Some solutions offered here are:

1) Develop new stock selection criteria for the investment portfolio by evaluating the performance of the stock in the previous year, based on criteria of Holding Period Return (HPR), Risk Premium (R_f), and Standard Deviation (σ).
2) Developing alternative weighting stocks method.

A. DEVELOPING CRITERIA FOR STOCK SELECTION

Developing criteria for stock selection is intended for guidance in determining the stocks that will be invested on DAPENTEL stock investment portfolio. The steps in the stock selection are:

1. *Stocks portfolio selection based on the HPR value of the stock.* The selection is by choosing stocks which have greater HPR value than the JCI HPR value in the same year. For example, during year 2006, there are 31 stocks that have HPR value higher than the JCI HPR value. Those 31 stocks then selected for DAPENTEL stock investment portfolio on year 2007. During year 2007, there are 37 stocks that have HPR value higher than the JCI HPR value, then selected for DAPENTEL stock investment portfolio on year 2008. Hereafter the exception in year 2008, the stock selection is not conducts because the stock performance during this year was influenced from the external factor and not reflected the stock performance itself. During year 2009, there are 45 stocks that have HPR value higher than JCI HPR value, then selected for DAPENTEL stock investment portfolio on year 2010. During year 2010, there are 41 stocks that have HPR value higher than the JCI HPR value then selected for DAPENTEL stock investment portfolio on year 2011.
2. *Stock portfolio selection based on the risk premium value.* The selection is by choosing stocks which have a positive risk premium value during year 2006, 2007, 2009, 2010, and 2011. For example, during year 2006 there are 38 stocks which have positive value of risk premium, then selected for DAPENTEL stock investment portfolio on year 2007. During year 2007 there are 60 stocks which have positive value of risk premium, then selected for DAPENTEL stock investment portfolio on year 2008. During year 2009 there are 50 stocks which have positive value of risk premium, then selected for DAPENTEL stock investment portfolio on year 2010. During year 2010 there are 53 stocks which have positive value of risk premium, then selected for DAPENTEL stock investment portfolio on year 2011.
3. *The stocks which are passed both criteria of number 1 and 2 above, then selected into DAPENTEL stock investment portfolio.* For example, the stocks chosen as investment portfolio in year 2007 were stocks which passed the criteria of number 1 and 2, therefore in 2007 stock investment portfolio there 31 stocks chosen, in 2008 there are 37 stocks, in 2010 there are 45 stocks, and in 2011 there are 41 stocks.

B. WEIGHTING THE STOCKS

After determine the selected stock as the DAPENTEL stock investment portfolio year 2007, 2008, 2010, and 2011, the next step is weighting those stocks. In this study, the authors will use three different weighting methods and choose the best one which will gives the most optimal results.

1) *Equally Weighted Portfolios.* Equally weighted portfolio is the method of stock weighting by distributing the stock investment fund equally to all selected stocks.
2) *The stock weighting method based on HPR performance of selected stock in the previous year.* This stock weighting method is conduct by considering the HPR value of selected stocks in previous year. The weighting formula is*:*

$$Weight\ of\ stock_X\ year_n = \frac{HPR\ value\ of\ stock_X\ year_{n-1}}{Total\ HPR\ value\ of\ stock\ investment\ portfolio\ year_{n-1}}$$

3) *The stock weighting method based on HPR and standard deviation value of selected stock in the previous year.* This stock weighting method is conduct by considering the HPR and standard deviation value of selected stock in the previous year. The weighting formula is:

4)
$$\text{Weight of stock}_x\ year_n = \frac{(HPR \text{ value of stock}_x \times Std.Dev \text{ value of stock}_x)\ at\ year_{n-1}}{Total\ (value\ of\ HPR\ \ year_{n-1} \times Std\ Dev\ year_{n-1})}$$

C. SIMULATION

Simulations is carried out to compare the result of stock weighting by using 3 different methods that have been described previously, which are Equally weighted portfolio, weight distribution based on stock HPR performance in the previous year, and weight distribution based on stock HPR and standard deviation performance in the previous year.

The equation used to obtain the amount of the investment in this simulation is:

$$\sum_{Return} Investment = Amount\ of\ stock\ (beginning\ year\ price - end\ year\ price)$$
$$= \left(\frac{investment\ fund \times\ stock\ weight}{beginning\ year\ stock\ price}\right) \times (end\ year\ price - beginning\ year\ price)$$

Table 4 below showed the results from simulation which compared between the stock investment return in each weighting methods with the existing DAPENTEL's investment return.

According to the table 4 below, in year 2007 the highest investment results come from weight distribution based on stock HPR performance in the previous year which is amounted 1.2trillions rupiahs. In year 2008, the highest investment results come from weight distribution based on stock HPR and standard deviation performance in the previous year, which is 4.49trillions rupiah. In year 2010, the highest investment results come from weight distribution based on stock HPR performance in the previous year which is 16.8trillion rupiah. In year 2011, the highest investment results from weight distribution based on stock HPR and standard deviation performance in the previous year, which is 6.391 trillion rupiahs.

Table 4 Investment Return from 3 new weighting methods and DAPENTEL's existing investment return for year 2007, 2008, 2010, and 2011

(in millions rupiah)	Investment result year 2007	Investment result year 2008	Investment result year 2010	Investment result year 2011
Existing DAPENTEL Investment	1,002,571.825	794,795.905	1,140,460.477	311,702.492
Equally Weighted	1,063,753.212	2,016,237.264	4,558,478.531	3,262,480.598
HPR	1,229,879.648	4,073,502.403	16,804,610.278	5,819,646.117
HPR and Standard Deviation	1,229,536.574	4,491,527.400	12,480,753.267	6,391,830.268

Below are the analyses of the results from simulation:

1) The highest investment returns come from investment method based on stock HPR performance in the previous year (2007 and 2010) and the weight distribution based on stock HPR and standard deviation performance in the previous year (in 2008 and 2011).
2) Stock investment was conduct through two stages, which are, *first,* selecting stock based on the performance of the previous year HPR, standard deviations, and the risk premium. *Second,* by weighting those selected stocks through a weighting method based on stock HPR and standard deviation performance in the previous year.

3) The results of the simulation showed that when using these 2 methods on stock investment, stock selection and selected stock weighting, will provide a greater investment return than existing DAPENTEL investment return (Table 4 above).
4) By using these 2 methods of stock investments, which are stock selection and stock weighting, will resulting in new ROI for total investment of DAPENTEL.

Table 5 Comparison between existing stock investment ROI with new stock investment ROI

Year	Existing Stock Investment ROI (%)	New Stock Investment ROI (%)
2007	68.9932005	83.51148761
2008	44.28739996	250.2756609
2010	48.21145666	527.6073194
2011	11.8870689	243.758484

From Table 5 above, it is known that the ROI of DAPENTEL stock investment was higher than existing ROI. In year 2007, the ROI of stock become 83.5% higher than existing ROI of stock which is 69%. In year 2008, the ROI of stock become 250% higher than existing ROI of stock which is 44 %. In 2010 the ROI of stock become 527% higher than existing ROI of stock which is 48%. In 2011 the ROI of stock become 243% higher than existing ROI of stock which is 11%.

5) By using the new method of stock market investments as proposed by the authors, the targeted ROI of DAPENTEL for year 2007, 2008, 2010 and 2011 can be achieved. Table 6 shows that in year 2007 the new ROI is 71% (target ROI 12.6%) which is higher than existing ROI at 62.4%. In year 2008 the new ROI is 48% (target ROI 12.86%) which is higher than existing ROI at -6.8%. In year 2010 the new ROI is 124% (target ROI 12.5%) which is higher than existing ROI at 17.7%. In year 2011 the new ROI is 55.5% (target ROI 13.46%) which is higher than existing ROI at 12.6%.

Table 6 Comparison between new ROI and existing ROI. Year 2007, 2008, 2010, and 2011

	2007	2008	2010	2011
The targeted ROI based SPI (%)	12.60	12.86	12.50	13.46
Existing ROI (%)	62.439	(6.834)	17.718	12.619
new ROI	71.056	48.020	124.140	55.519

There are 2 steps on developing stock investment portfolio, *first*, is selecting stocks for the portfolio by considering previous year HPR, risk premium, and standard deviation performance. *Second,* by selecting stock weight distribution method based on stock HPR and standard deviation performance in the previous year. These methods will result in a higher return on investment than DAPENTEL existing stock investment.

4. Implementation Plans And Recommendations

A. Preparation of Human Resources

Preparation of Human Resources, in this case the unit investment of DAPENTEL is particularly conducted in investment of market stock. Preparation is done through training about optimization

stock investing and doing internship in other investment companies, known to have good performance.

B. Development of Evaluation Form

By making a tool to evaluate the success rate of adoption of new methods of stock market investing. The aimed is to make the company can assess the effect of the application of this new method in the earliest possible time. Evaluation was made with the involvement of the owners and management DAPENTEL that have similar goals.

C. Socialization

Socialization is done to the DAPENTEL owner egg PT Telekomunikasi Indonesia Tbk, DAPENTEL officials and pension beneficiaries of DAPENTEL. Socialization is done through early meetings to discuss investment policy DAPENTEL.

Recommendations for DAPENTEL

DAPENTEL must continue to evaluate the method of investment that is being implemented today. It has to be done for the entire investment portfolio held by DAPENTEL by doing the sustainable evaluations; DAPENTEL can continue to improve their investment method to get better results.

Recommendations for Further Research

The study was limited to the technical analysis. Further study can assess the preparation of a stock portfolio by considering the fundamental aspects of each share.

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